REMARKS

Claims 1-14 and 21-22 have been amended, and claim 20 has been cancelled. Claims 1-19 and 21-22 are pending, of which claims 15, 16 and 22 are independent claims.

The Examiner is thanked for his time in a telephone conference on October 3, 2006. During that discussion, it was pointed out that Ishizuka does not itself teach or suggest multiple tracks on an encoder scale, but rather only one, and that although Thorburn shows multiple tracks, it does not teach or suggest that a wavefront dividing element be utilized for any reason. On that basis, it was believed that the independent claims as previously pending were allowable. The Examiner agreed to fully consider a written argument along those lines.

It was later realized that original independent claim 1 was directed to the sensor head only, reciting the encoder scale in the preamble. It was decided to amend the claims to direct them to an encoder including a multiple-track encoder scale, so as to clarify the distinctions from Ishizuka and the other art of record. Thus claim 1 has been re-written to depend from original independent claim 15, and claim 20 has been cancelled. Other claim amendments have been made for consistency. Claim 22 has been re-written in independent form, and thus should now be allowable in view of the indication in the Office Action. It is respectfully submitted that this amendment does not raise any new issues.

In the Office Action, claims 1-21 were rejected as being obvious in view of Thorburn US 2003/0047674 and Ishizuka (US 5,569,913). This rejection is respectfully traversed with respect to the claims as amended herein.

Claim 15 recites an optical encoder having a sensor head, an encoder scale and a signal processor. The sensor head includes an optical wavefront dividing element and has first and second optical detectors disposed thereon. The encoder scale includes first and second tracks and is disposed opposite the sensor head with the beam divider disposed therebetween such that a light beam

emitted by the light source is incident on the wavefront dividing element. The wavefront dividing element divides the incident beam into first and second beams incident on the first and second tracks of the encoder scale respectively, such that light from the first beam is reflected and diffracted by the first track to the first optical detector, and light from the second beam is reflected and diffracted by the second track to the second optical detector.

Thorburn shows an optical encoder having many elements of claim 15, including multiple tracks, but does not teach or suggest any use of a wavefront dividing element to form separate optical paths from the source to a respective track and then to a respective detector. Figure 1 of Thorburn shows a single beam 102 used to illuminate both tracks 162 and 166. Figure 9 of Thorburn illustrates the configuration in side view.

Ishizuka shows an encoder with a scale 20 having a single track G2. A grating G1 divides the beam from the source 1 into multiple diffraction beams that strike the scale G2 at different locations (P1, P2 etc.), at which the beams are diffractively reflected. Some of the reflected beams (e.g. R2(-) and R1(+) as shown in Fig. 2) are incident together at a multiple-element grating G3, and after diffractive transmission through G3 form an interference beam that is detected by a set of phase-shifted detectors PD1 - PD4.

As pointed out during the above-referenced telephone conference, Ishizuka does not divide the source beam for purposes of directing the diffraction beams to different tracks of a scale, and in fact does not even disclose a multiple-track scale. Rather, the diffraction beams are directed to different locations of a single track G2, so as to generate respective reflected beams that eventually form an interference pattern that can be sensed by the detectors PD1 - PD4 to detect linear movement of the scale 20. There is no teaching or suggestion in Ishizuka to utilize the grating G1 to create diffraction beams that are directed to different tracks of an encoder scale.

Based on the above analysis of the respective teachings of Thorburn and Ishizuka, it should be clear that there is no teaching or suggestion in these references of an encoder having a multiple-track encoder scale and a wavefront dividing element that divides the incident beam into first and second beams incident on first and second tracks of the encoder scale respectively, such that light from the first beam is reflected and diffracted by the first track to the first optical detector, and light from the second beam is reflected and diffracted by the second track to the second optical detector, as set forth in claim 15. Thorburn shows only the use of multiple scale tracks with no disclosure of any means of generating different beams for the different tracks. Ishizuka shows only the use of a grating G2 to generate beams that are directed to different parts of single track to eventually form a single interference beam incident on detectors PD1-PD4. As neither of these references teaches or suggests at least these portions of claim 15, claim 15 is seen to be patentable in view of these references notwithstanding the requirements of 35 U.S.C. § 103(a).

The remaining claims (except for claim 22) incorporate features similar to those discussed above, and are therefore seen to be allowable over Thorburn and Ishizuka for at least the same reasons.

Conclusion

In view of the amendments herein and the foregoing remarks, this Application should be in condition for allowance. A Notice to this affect is respectfully requested. If the Examiner believes, after this Response, that the Application is not in condition for allowance, the Examiner is respectfully requested to call Applicant's Representative at the number below.

Applicant hereby petitions for any extension of time which is required to maintain the pendency of this case. If there is a fee occasioned by this response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 50-3661.

If the enclosed papers or fees are considered incomplete, the Patent Office is respectfully requested to contact the undersigned collect at (508) 616-2900, in Westborough, Massachusetts.

Respectfully submitted,

James F. Thompson, Esq.
Attorney for Applicant
Registration No.: 36,699
Bainwood, Huang & Associates, L.L.C.
Highpoint Center
2 Connector Road
Westborough, Massachusetts 01581
Telephone: (508) 616-2900
Facsimile: (508) 366-4688

Attorney Docket No.: 1011-015.001

Dated: October 11, 2006